REMARKS

Claims 20, 22, 23, 27, 28, 31, 32, 34, 35, 38, 39, 43, 45, 46, 47, 50, 51, 54, 55, 57, and 58 are amended in this paper. New claims 65-70 are added in this paper. Accordingly, claims 20-70 are now pending.

Claim Rejections Under 35 U.S.C. § 103

Claims 20-64 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,914,014 to *Kartchner* [hereinafter *Kartchner*] in view of U.S. Patent No. 6,583.394 to *Araya et al.* [hereinafter *Araya et al.*]. This rejection is understood to be based on the premise that regarding claims 20 and 43, *Kartchner* discloses a demulsification arrangement to remove microwave-absorptive material from a substrate comprising a containment structure and an RF applicator delivered from the power source operatively coupled and positioned within the containment structure and comprising an antenna body defined as a waveguide. *Araya et al.* is cited as resolving the level of ordinary skill in the art and as evidence of obviousness and is asserted to teach, in Figure 4, a waveguide antenna applicator defined as slotted waveguides 12a arranged with slots perpendicular to the axis. The rejection is further understood to be based on the premise that it would have been obvious to employ such a waveguide in lieu of the cylindrical waveguide in *Kartchner*.

Applicant traverses the rejection. Claims 20 and 43 have been amended to recite that the slots are non-uniform in size. By contrast, neither *Kartchner* nor *Araya et al.* discloses or suggests an RF applicator having an antenna body with the structure recited in claims 20 and 43. In particular, *Kartchner* is silent as to whether the microwave waveguide used in the system disclosed in *Kartchner* has slots at all, and therefore contains no disclosure regarding the sizes of the slots. While the waveguides illustrated in Figure 4 of *Araya et al.* are depicted as having slots, *Araya et al.* is similarly silent as to the sizes of the slots. As discussed in the declaration submitted with this Response, the use of slots that are non-uniform in size promotes an even distribution of microwave energy along the length of the antenna body. In this respect, *Araya et al.* actually teaches away from the use of the waveguides illustrated in Figure

4, stating that "the waveguide arrangements of FIGS. 3 and 4 do not provide the uniformity of microwave power distribution required to minimize ceramic piece distortion and/or cracking at the microwave input power levels necessary for the effective firing of ceramic products such as thin-walled ceramic honeycomb structures." See column 7, lines 11-16.

Accordingly, Applicant respectfully submits that claims 20 and 43 recite elements that are not disclosed or suggested by *Kartchner* or *Araya et al.*, considered separately or in combination. Thus, claims 20 and 43 are patentably distinct from *Kartchner* in view of *Araya et al.* Applicant respectfully requests that the rejection of claims 20 and 43 under 35 U.S.C. § 103(a) be withdrawn.

Claims 21-42 and 44-64 further define various features of the invention above the prior art and incorporate all of the limitations recited in claims 20 and 43, from which they respectively depend, either directly or via intervening claims of intermediate scope.

In particular, claims 21 and 44 further recite that the antenna body is tapered along the longitudinal axis. Neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests the use of a tapered antenna body having slots that are non-uniform in size.

Claims 22 and 45 further recite that the antenna body is tapered from one cross-sectional area at an end proximate to the RF generator to a smaller cross-sectional area at another end distal from the RF generator. Neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests the use of an antenna body that is tapered from one cross-sectional area at a proximal end of the antenna body to a smaller cross-sectional area at the distal end of the antenna body, and that has slots that are non-uniform in size.

Claims 23 and 46 further recite that the antenna body comprises a plurality of walls that form a rectangular cross-section. Neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests the use of an antenna body that comprises a plurality of walls that form a rectangular cross-section, and that has slots that are non-uniform in size.

Claims 24 and 47 further recite that the slots are defined by each of two parallel faces. As discussed above, *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all. In addition, while the waveguides shown in Figure 4 of *Araya et al.* are illustrated as having slots, there is no disclosure as to whether the slots are defined by each of two parallel faces. Applicant notes that, in the configuration shown in Figure 4, the waveguides 12a "are positioned to direct power through kiln roof 26a." See column 7, lines 8-9. With the waveguides 12a positioned in this manner, that is, above the kiln roof 26a, it is logical to surmise that there is no need to direct power away from the kiln roof 26a, and thus no need for slots facing away from the kiln roof 26a. Accordingly, it is Applicant's belief that the waveguides 12a shown in Figure 4 of *Araya et al.* only have slots formed on the face that face toward the kiln roof 26a.

Claims 25 and 48 further recite that the antenna body comprises two walls formed from an RF opaque material. Neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests the use of an antenna body comprising two walls formed from an RF opaque material, having slots that are non-uniform in size.

Claims 26 and 49 depend from claims 25 and 48, respectively, and further recite that the walls are formed from aluminum. Neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests the use of an antenna body comprising two aluminum walls, having slots that are non-uniform in size.

Claims 27 and 50 further recite that the RF applicator comprises an RF transparent antenna enclosure formed proximate the antenna body to substantially seal the antenna body from an environment external to the RF applicator. Claims 31 and 54 depend from claims 27 and 50, respectively, and further recite that the antenna enclosure is formed from a material having a low dielectric constant. Claims 33 and 56 depend from claims 31 and 54, respectively, and further recite that the antenna enclosure is formed from fiberglass. Neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests the use of an RF transparent antenna enclosure formed proximate the antenna body to substantially seal the

antenna body from an external environment.

Claims 28 and 51 further recite that the RF applicator comprises an RF transparent window arrangement disposed proximate the outer surface of the antenna body and arranged to cover the plurality of slots. Claims 29 and 52 depend from claims 28 and 51, respectively, and further recite that the RF transparent window arrangement comprises a plurality of RF transparent windows formed from a material having a low dielectric constant. Claims 30 and 53 depend from claims 29 and 52, respectively, and further recite that the RF transparent windows are formed from fiberglass or TEFLON® polytetrafluoroethylene. As discussed above, *Kartchner* is silent as to whether the applicator waveguide 16 has slots, and therefore does not teach the use of an RF transparent window arrangement arranged to cover a plurality of slots. *Araya et al.* contains no disclosure relating to RF transparent windows.

Claims 32 and 55 further recite that at least some of the slots have sizes that increase with increasing distance from the RF generator. As discussed above, *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all. *Araya et al.* contains no teaching regarding using slots that have sizes that increase with increasing distance from the RF generator.

Claims 34 and 57 further recite that the slots are uniformly spaced apart from one another along the length of the antenna body. By contrast, *Araya et al.* teaches a "graduated distribution of slots with increasing distance from the source" rather than a uniform spacing of slots. See column 8, lines 19-21. As discussed above, *Kartchner* is silent as to whether the applicator waveguide has slots at all.

Claims 35 and 58 further recite a cap coupled to an end of the antenna body distally located from the RF generator. Claims 36 and 59 depend from claims 35 and 58, respectively, and recite that the cap is arranged to reflect an RF signal propagated within the antenna body to generate constructive interference. Claims 37 and 60 depend from claims 35 and 58, respectively, and recite that the cap is formed from aluminum. By contrast, neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests an antenna body having a cap coupled to an end

distally located from the RF generator.

Claim 38 further recites that the antenna body comprises first and second faces that are spaced apart from one another and in which the slots are formed, the slots being arranged so as to radiate the microwave energy over substantially less than a 360° arc outward from the RF applicator.

Claim 39 further recites a control arrangement operatively coupled to the RF generator. Neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests a control arrangement used in conjunction with an RF applicator having an antenna body that has slots of non-uniform size.

Claim 40 further recites an outlet port formed on the container. *Araya et al.* is concerned with ceramic processing, not treatment of emulsions, and contains no teaching relating to an outlet port. *Kartchner* fails to disclose or suggest a demulsification arrangement that includes a container having an outlet port and an antenna body that has slots of non-uniform size, as *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all.

Claims 41 and 61 further recite that the microwave-absorptive material comprises a hydrocarbon. Claims 42 and 62 further recite that the substrate comprises water. *Araya et al.* is concerned with ceramic processing, not treatment of emulsions, and contains no teaching relating to either a microwave-absorptive material comprising a hydrocarbon or a substrate comprising water. *Kartchner* fails to disclose or suggest a demulsification arrangement that is used to separate an emulsion of a hydrocarbon and water and that includes an antenna body that has slots of non-uniform size, as *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all.

Claim 63 further recites that the treatment volume can be either an underground treatment volume or an above-ground contained treatment volume. Claim 64 depends from claim 63 and further recites that the above-ground contained treatment volume comprises a container to receive the emulsion. The container has at least one outlet port defined by a wall of the container. *Araya et al.* is concerned with ceramic processing, not treatment of emulsions, and contains no teaching relating to either an

underground treatment volume or an above-ground contained treatment volume. *Kartchner* fails to disclose or suggest a demulsification arrangement that includes an above-ground contained treatment volume and an antenna body having slots of non-uniform size, as *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all. Further, *Kartchner* discloses a system that uses a particular arrangement and configuration of feedstock treatment chamber spaces. "The dimensions of the dual process chambers are chosen to maximize a multimode resonant pattern at the working radio frequency and feedstock dielectric characteristics." See column 4, lines 30-33. Thus, *Kartchner* is completely inapplicable to underground treatment volumes, which typically have much less controlled dimensions.

In view of at least the above reasoning, Applicant respectfully requests that the rejection of claims 20-64 under 35 U.S.C. § 103(a) as unpatentable over *Kartchner* in view of *Araya et al.* be withdrawn.

Applicant respectfully submits that new claim 68 is patentably distinct from the prior art of record. Claim 68 is directed to a demulsification arrangement usable with a power source to remove a microwave-absorptive material from a substrate. The demulsification arrangement consisting essentially of a radio frequency (RF) generator connectable to the power source and configured to generate an RF signal and an RF applicator operatively coupled to the RF generator and positionable within a treatment volume containing an emulsion comprising the microwave-absorptive material and the substrate to deliver microwave energy into the treatment volume. The RF applicator comprises an antenna body having a longitudinal axis and a length and an outer surface defining a plurality of slots substantially uniformly spaced apart from one another along the length of the antenna body and non-uniform in size. When the containment structure contains the emulsion and the RF applicator delivers the

microwave energy into the treatment volume, the microwave-absorptive material and the substrate are demulsified.

As discussed above, neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests the use of an RF applicator comprising an antenna body having slots that are non-uniform in size. Moreover, neither reference discloses or suggests the use of an RF applicator comprising an antenna body having slots that are substantially uniformly spaced apart from one another along the length of the antenna body. Further, Applicant draws the Examiner's attention to the use in claim 68 of the transitional phrase "consisting essentially of," which excludes the use of certain elements that Applicant submits are necessary in the system disclosed in *Kartchner*. For instance, in the system disclosed in *Kartchner*, "all incoming feedstock is preheated by conventional means . . . to reduce viscosity and to aid in the prefiltration of rocks and other large solid masses from the feedstock emulsion." See column 3, lines 63-67. Indeed, "feed temperatures of 120 to 180 degrees Fahrenheit or more are needed, depending on the melting temperature of organic solids in the mixture as well as the type and amount of entrained non-melting solids such as dirt and sand." See column 4, lines 1-5. Thus, the system of *Kartchner* requires conventional preheating means that are excluded from the arrangement recited in claim 68 of the instant application. Further, Applicant submits that, in the system of *Kartchner*, "flanges 39 couple outlet pipes to the appropriate feedstock handling equipment such as centrifuges and collection tanks." See column 4, lines 41-43. Thus, the system of *Kartchner* requires the use of centrifuges to complete the separation process, unlike the arrangement recited in claim 68.

Based on at least the above reasoning, Applicant respectfully requests the allowance of claim 68 and of claims 69-70, which depend from claim 68 and which incorporate all of the limitations of claim 68.

Conclusion

The amendments to the claims presented above are believed to place the application in condition for allowance. Applicant respectfully requests a timely Notice of Allowance.

Respectfully submitted,

for the Applicant
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